

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

In re Patent Application of

Atty Dkt. CC-839-1383

LAGRANGE et al.

Serial No. 10/774,400

Filed: February 10, 2004

Title: ADVANCED FIRTREE AND BROACH SLOT FORMS FOR TURBINE STAGE 1
AND 2 BUCKETS AND ROTOR WHEELS

Mail Stop Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450



C# M#

Confirmation No. 9775

TC/A.U.: 3745

Examiner: C. Verdier

Date: September 12, 2008

AF / IPW

Sir:

☐ **Correspondence Address Indication Form Attached.**

☐ **NOTICE OF APPEAL**

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences
from the last decision of the Examiner twice/finally rejecting applicant's claim(s).

\$510.00 (1401)/\$255.00 (2401) \$

☒ A **Replacement BRIEF** is attached in the pending appeal of the above-identified application.

The Appeal Brief Fee was previously paid on February 5, 2008. \$510.00 (1402)/\$255.00 (2402) \$ 0.00

☐ Credit for fees paid in prior appeal without decision on merits

-\$ ()

☐ A reply brief is attached.

(no fee)

☐ Petition is hereby made to extend the current due date so as to cover the filing date of this
paper and attachment(s)

One Month Extension \$120.00 (1251)/\$60.00 (2251)

Two Month Extensions \$460.00 (1252)/\$230.00 (2252)

Three Month Extensions \$1050.00 (1253)/\$525.00 (2253)

Four Month Extensions \$1640.00 (1254)/\$820.00 (2254) \$

☐ Concurrently filed Amendment.

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TOTAL FEE ENCLOSED \$ 0.00

☐ **CREDIT CARD PAYMENT FORM ATTACHED.**

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension.
The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or
asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this
firm) to our **Account No. 14-1140**. A duplicate copy of this sheet is attached.

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NIXON & VANDERHYE P.C.
By Atty: Chris Comuntzis, Reg. No. 31,097

Signature: _____

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Signature: 

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Patent Application of
LAGRANGE et al.

Serial No. 10/774,400

Filed: February 10, 2004



Atty. Ref.: 839-1383

TC/A.U.: 3745

Examiner: C. Verdier

For: ADVANCED FIRTREE AND BROACH SLOT FORMS FOR TURBINE
STAGE 1 AND 2 BUCKETS AND ROTOR WHEELS

September 12, 2008

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Sir:

Responsive to the Notification of Non-Compliant Appeal Brief mailed August 13, 2008, a Replacement Appeal Brief is attached, which expressly states the following changes as noted in the notification of Non-Compliant Appeal Brief:

No. 4 - Each and every element of the claims in Section (V) of the Replacement Appeal Brief now references each corresponding reference to the specification by page and line number, and to the drawings, by reference characters associated therewith, as requested; and

No. 8 - separate sections addressing the rejections in paragraphs (B1) and (B2) of Section VI have been created in Section VII; mention is now made in section VII referring to where the evidence entered by the Examiner and relied upon by appellant in the appeal can be found.

An early and favorable consideration is solicited.



Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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LAGRANGE et al.

Serial No. 10/774,400

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For: ADVANCED FIRTREE AND BROACH SLOT FORMS FOR TURBINE
STAGE 1 AND 2 BUCKETS AND ROTOR WHEELS



Atty. Ref.: 839-1383

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Examiner: C. Verdier

September 12, 2008

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLACEMENT APPEAL BRIEF

Sir:

Appellant hereby appeals to the Board of Patent Appeals and Interferences from
the last decision of the Examiner.

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(I) REAL PARTY IN INTEREST

The real party in interest is General Electric Company, a corporation of the
United States of America.

(II) **RELATED APPEALS AND INTERFERENCES**

The appellant, the undersigned, and the assignee are aware of the related appeal of patent application 10/774,399 filed on February 10, 2004 involving similar subject matter, naming the same inventors, and having the same assignee. Because the claims involved in the related appeal and the rejections thereof are obviously not identical to those involved in this appeal it cannot be conclusively predicted whether the related appeal will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

(III) STATUS OF CLAIMS

Claims 1-9, 11 and 21-28 have been canceled. Claims 10, 12-20 and 29-62 are pending and claims 10, 12-20, 29-45, 48-49, 52-53, 55-56 and 59-60 have been rejected and are being appealed. Claims 46, 47, 50, 51, 54, 57, 58, 61 and 62 have been deemed to contain allowable subject matter but are objected to as being dependent upon a rejected base claim. The Examiner has stated that the objected to claims "would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims." See, Final Office Action at page 25.

(IV) STATUS OF AMENDMENTS

An Amendment was erroneously filed concurrently with this Appeal Brief amending claim 29 to correct an antecedent basis problem identified by the Examiner in the Final Office Action.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

The invention of the claims relates to improved turbine buckets and wheel broach slots having dimensional relationships which reduce the number of buckets and corresponding wheel broach slots and the stresses acting on the buckets and wheel at the point of their attachment.

A listing of each appealed claim is given below including exemplary references to paragraph numbers of the specification and Figures of the application.

10. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 31-33; Paragraphs 27-29 and 33] and tangs [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 28-30; Paragraphs 27-29 and 33]; and

a plurality of buckets each having a corresponding interleaved system of fillets [Fig. 1, ref. 11, Fig. 2A, ref. 21, 25-27; Paragraphs 30-32 and 34-37] and tangs [Fig. 1, ref. 11, Fig. 2A, ref. 21, 22-24; Paragraphs 30-32 and 34-37] so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and wheelposts act to reduce stresses acting on said fitted buckets and wheelposts, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27-37];

wherein the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of said buckets define two points of a respective line that form an angle of 20.782° with the center line [Fig. 2A, ref. 202, 204, 205, 207, Fig. 10, ref. E; Paragraphs 45, 48 (as amended)]; and;

wherein a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782° with the center line [Fig. 10, ref. T₁, T₂; Paragraph 48 (as amended)].

12. A turbine as claimed in claim 10, wherein the fillets formed on said plurality of buckets have angles ranging from 50° to 57° [Fig. 2A, ref. 201, 202, 204, 205, Fig. 9, ref. A, B, Fig. 10, ref. F; Paragraph 47].

13. A turbine as claimed in claim 10, each one of said buckets and wheelposts having three interleaved tangs and fillets [Fig. 2A, ref. 22-27, Fig. 2B, ref. 28-33; Paragraphs 29-37].

14. A turbine as claimed in claim 13, wherein each of said buckets having a bottom tang formed from curved surfaces having more than one radius of curvature [Fig. 10, ref. R₁, R₁₃; Paragraph 54].

15. A turbine as claimed in claim 14, wherein each of said buckets further includes at least one straight surface [Fig. 2A, ref. 201; Paragraph 30].

16. A turbine as claimed in claim 10, wherein each of said wheelposts having a bottom fillet formed from curved surfaces having more than one radius of curvature [Fig. 11, ref. 33, Fig. 12, ref. R₇, R₇; Paragraph 64].

17. A turbine as claimed in claim 16, wherein each of said wheelposts further includes at least one straight surface [Fig. 2B, ref. 217; Paragraph 34].

18. A turbine as claimed in claim 14, wherein said curved surfaces have radii of curvatures of .3762 inches and .5556 inches [Fig. 10, ref. R₁, R₁₃; Paragraph 54].

19. A turbine as claimed in claim 16, wherein said curved surfaces have radii of curvatures of .3822 inches and .5616 inches [Fig. 11, ref. 33, Fig. 12, ref. R₇, R₇; Paragraph 64].

20. A turbine as claimed in claim 10, wherein a top surface of each one of said wheelposts being scalloped so as to reduce the weight of said wheel [Fig. 7, ref. 70, Fig. 8, ref. 70; Paragraph 40].

29. A bucket for insertion into a wheelpost of a turbine rotor, said bucket being formed from interleaved fillets and tangs which complement interleaved fillets and tangs formed in the wheelpost,

wherein said interleaved system of fillets and tangs on said buckets and wheelposts act to reduce stresses acting on said fitted buckets and wheelposts, the fillets and tangs of said interleaved system of fillets [Fig. 1, ref. 10-12, Figs. 2A and 2B,

ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27, 30-33 and 34-37] and tangs [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27, 30-33 and 34-37] each being formed by a combination of curved and straight surfaces ;

wherein the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of said buckets define two points of a respective line that form an angle of 20.782° with the center line [Fig. 2A, ref. 202, 204, 205, 207, Fig. 10, ref. E; Paragraphs 45, 48 (as amended)]; and

wherein a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782° with the center line [Fig. 10, ref. T₁, T₂; Paragraph 48].

30. A bucket as claimed in claim 29, said bucket having three interleaved tangs and fillets [Fig. 2A, ref. 22-27; Paragraphs 29-32].

31. A bucket as claimed in claim 30, said bucket having a bottom tang formed from curved surfaces having more than one radius of curvature [Fig. 10, ref. R₁, R₁₃; Paragraph 54].

32. A bucket as claimed in claim 31, said bucket further including at least one straight surface [Fig. 2A, ref. 201; Paragraph 30].

33. A bucket as claimed in claim 31, said curved surfaces having radii of curvatures of .3762 inches and .5556 inches [Fig. 10, ref. R₁, R₁₃; Paragraph 54].

34. A bucket as claimed in claim 30, said bucket having an upper tang formed from curved surfaces having more than one radius of curvature [Fig. 2A, ref. 22, Fig. 10, ref. R₅, R₆; Paragraph 56].

35. A bucket as claimed in claim 31, said bucket having an upper tang formed from curved surfaces having more than one radius of curvature [Fig. 2A ref. 22, Fig. 10, ref. R₅, R₆; Paragraph 56].

36. A bucket as claimed in claim 34, said bucket further including at least one straight surface [Fig. 2A, ref. 201; Paragraph 30].

37. A bucket as claimed in claim 30, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature [Fig. 2A, ref. 23, Fig. 10, ref. R₂, R₃, R₄, 205, 207; Paragraph 56].

38. A bucket as claimed in claim 31, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature [Fig. 2A, ref. 23, Fig. 10, ref. R₂, R₃, R₄, 205, 207; Paragraphs 31, 56].

39. A bucket as claimed in claim 35, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature [Fig. 2A, ref. 23, Fig. 10, ref. R₂, R₃, R₄, 205, 207; Paragraphs 31, 56].

40. A bucket as claimed in claim 37, said bucket further including at least one straight surface [Fig. 2A, ref. 201; Paragraph 30].

41. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 31-33; Paragraphs 27-29 and 33] and tangs [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 28-30; Paragraphs 27-29 and 33]; and

a plurality of buckets each having a corresponding interleaved system of fillets [Fig. 1, ref. 11, Fig. 2A, ref. 21, 25-27; Paragraphs 30-32 and 34-37] and tangs [Fig. 1, ref. 11, Fig. 2A, ref. 21, 22-24; Paragraphs 30-32 and 34-37] so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27-37];

wherein above the uppermost tang on each of said buckets there is a compound fillet having a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches [Fig. 10, ref. R₆, R_{6'}; Paragraph 56].

42. The turbine as claimed in claim 41, wherein below the upper most tang on each of said buckets there is a fillet having a radius of curvature of 0.0741 inches [Fig. 10, ref. R₄; Paragraph 56].

43. The turbine as claimed in claim 42, wherein above the bottom most tang on each of said buckets there is a fillet having a radius of curvature of 0.0897 inches [Fig. 10, R₂, Paragraph 56].

44. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 31-33; Paragraphs 27-29 and 33] and tangs [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 28-30; Paragraphs 27-29 and 33]; and

a plurality of buckets each having a corresponding interleaved system of fillets [Fig. 1, ref. 11, Fig. 2A, ref. 21, 25-27; Paragraphs 30-32 and 34-37] and tangs [Fig. 1, ref. 11, Fig. 2A, ref. 21, 22-24; Paragraphs 30-32 and 34-37] so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel ;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27-37];

wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 1.9836 inches [Fig. 9, ref. L₅; Paragraph 51].

45. The turbine as claimed in claim 44, wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to a first intersection

point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang is 0.8429 inches [Fig. 9, ref. L₇; Paragraph 51].

48. The turbine as claimed in claim 44, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees [Fig. 9, ref. A; Paragraph 47].

49. The turbine as claimed in claim 45, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees [Fig. 9, ref. A; Paragraph 47].

52. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 31-33; Paragraphs 27-29 and 33] and tangs [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 28-30; Paragraphs 27-29 and 33]; and

a plurality of buckets each having a corresponding interleaved system of fillets [Fig. 1, ref. 11, Fig. 2A, ref. 21, 25-27; Paragraphs 30-32 and 34-37] and tangs [Fig. 1, ref. 11, Fig. 2A, ref. 21, 22-24; Paragraphs 30-32 and 34-37] so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel ;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a

combination of curved and straight surfaces [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27-37];

wherein below the uppermost tang on each of said broach slots there is a fillet having a radius of curvature of 0.0959 inches [Fig. 12, ref. R₁₁; Paragraph 65].

53. The turbine as claimed in claim 52, wherein above the bottom most tang on each of said broach slots there is a fillet having a radius of curvature of 0.1037 inches [Fig. 12, ref. R₉; Paragraph 65].

55. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 31-33; Paragraphs 27-29 and 33] and tangs [Fig. 1, ref. 10, 12, Fig. 2B, ref. 12, 28-30; Paragraphs 27-29 and 33]; and

a plurality of buckets each having a corresponding interleaved system of fillets [Fig. 1, ref. 11, Fig. 2A, ref. 21, 25-27; Paragraphs 30-32 and 34-37] and tangs [Fig. 1, ref. 11, Fig. 2A, ref. 21, 22-24, ; Paragraphs 30-32 and 34-37] so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel ;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces [Fig. 1, ref. 10-12, Figs. 2A and 2B, ref. 12, 21, 22-24, 25-27, 28-30, 31-33; Paragraphs 27-37];

wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 1.9836 inches [Fig. 11, ref. L₁₈; Paragraph 61].

56. The turbine as claimed in claim 55, wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet is 0.8433 inches [Fig. 11, ref. L₂₀; Paragraph 61].

59. The turbine as claimed in claim 55, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees [Fig. 11, ref. A; Paragraphs 47 and 58].

60. The turbine as claimed in claim 56, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees [Fig. 11, ref. A; Paragraphs 47 and 58].

(VI) GROUND OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 10, 12-20 and 29-40 are properly rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is noted that the Examiner's rejection of claim 29 to the extent that "'said buckets' lacks antecedent basis" is not being appealed, that Appellant acquiesced in the rejection of claim 29 on this basis but asks that it be held in abeyance pending the Board's decision on the appealed issues in this case at which time Appellant will correct the antecedent basis problem in claim 29 in accordance with the Board's decision in this appeal. See Office action at page 3, last line.

B1. Whether claims 29-32 are anticipated under 35 U.S.C. §102(b) by Webb or

B2. Whether claims 29-32 are anticipated under 35 U.S.C. § 102(b) by Johnson.

C. Whether claims 10 and 13-19 would have been obvious under 35 U.S.C. §103(a) over Webb in view of By.

D. Whether claim 12 would have been obvious under 35 U.S.C. §103(a) over Webb and By in view of United Kingdom 677,142 (hereinafter "the '142 patent").

E. Whether claim 20 would have been obvious under 35 U.S.C. §103(a) over Webb and By in view of Caruso.

F. Whether claim 33 would have been obvious under 35 U.S.C. §103(a) over Webb.

G. Whether claims 34-40 would have been obvious under 35 U.S.C. §103(a) over Webb in view of Leonardi.

H. Whether claims 41-43 would have been obvious under 35 U.S.C. §103(a) over Pisz in view of By.

I. Whether claims 44-45, 55-56 and 59-60 would have been obvious under 35 U.S.C. §103(a) over Heinig in view of By.

J. Whether claims 48-49 would have been obvious under 35 U.S.C. §103(a) over Heinig and By in view of Phipps.

K. Whether claims 52-53 would have been obvious under 35 U.S.C. §103(a) over Johnson in view of By.

(VII) ARGUMENT

A. Whether claims 10, 12-20 and 29-40 are properly rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 10 and 29 and their respective dependent claims 12-20 and 30-40 require a specific angular relationship between the center line of the bucket and a line defined by tangent lines drawn along the straight surfaces of each of the two uppermost tangs on each side of the bucket. Both of independent claims 10 and 29 require in relevant part:

wherein the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of said buckets define two points of a respective line that form an angle of 20.782° with the center line; and . . .

This relationship is shown in Figure 10 where in viewing, for example, the right hand side of the bucket, tangent lines drawn along the straight surfaces of right hand tang 22 and right hand tang 23 (the two uppermost tangs) define two points of a line that forms an angle E with the centerline. The angle E (on each side of the bucket) formed by each of these two lines and the center line of bucket equals 20.782 degrees.

The Examiner has rejected claims 10 and 29 because he has misinterpreted the relevant claim language and implies that Appellant's requirement that "the straight surfaces of each of the two uppermost tangs on each side of a centerline bisecting each of the buckets" means that only the uppermost tang on each side of the bucket, i.e., tang 22 in Appellant's Figure 10 is utilized to "define a point of a line that forms an angle

of 20.782 degrees." See, Office Action at pages 3-4 (emphasis in original) and the Examiner's sketches of pages 5 and 7 therein. Thus the Examiner has misconstrued the claim language that requires the use of two tangs on each side of the bucket to define the line that forms angle E with the center line, as required by the above referenced relevant portion of claim 10.

Moreover, the Examiner's interpretation of the claim language is also erroneous because a line cannot properly be defined by a single point and, by doing so, leads to the incongruous result illustrated by the Examiner's annotated Figure 1 in the Office Action wherein it is possible to draw a line through the point determined by tangent lines of a single tang (i.e., tang 28) at any angle (including an angle of 20.782 degrees). But as shown in annotated Figure 1 the line drawn by the Examiner is not defined by tangent lines drawn using the two uppermost tangs 28 and 30 to define two points for defining the line, but by only using the single uppermost tang 28.

Accordingly, the Examiner's rejections of claims 10, 12-20 and 29-40 on the basis that claims 10 and 29 should be amended to define a line utilizing a single point defined by tangent lines along a single tang is in error and should be reversed.

The Examiner has also rejected claim 12 stating that "fillets" is inaccurate and should be changed to --tangs--. Appellant respectfully submits that the Examiner is in error and that claim 12 is fully supported in the application by Figures 9 and 10, and paragraph 47 wherein the angles of fillets 25, 26 and 27 are given by angles A, B and F, respectively, as 50.000°, 56.087°, and 56.964°. Accordingly, the Examiner's rejection of claim 12 is also in error and should be reversed.

Finally, the Examiner has rejected claim 29 because "buckets" lacks antecedent basis. As noted previously, Appellant acquiesces with this rejection but asks that it be held in abeyance until the Board's decision with regards to the appealed issues in this case, at which time Appellant will correct the antecedent basis problem in claim 29 in accordance with the Board's decision in the Appeal.

B1. Whether claims 29-32 are anticipated under 35 U.S.C. § 102(b) by Webb.

In rejecting claims 29-32 as being anticipated by Webb, the Examiner has made the same error in rejecting these claims under 35 U.S.C. 112, second paragraph, discussed above. Namely, the Examiner has erroneously used a single upper tang (one on each side of the bucket) to determine a single point used to define a line forming an angle of 20.782° with the center line of the bucket. See the Examiner's annotated sketch at page 5 of the Office Action dated October 16, 2007. If the two uppermost tangs of each reference are used, as required by the claim language, to define the line then the angle formed with the center line is less than 14° in Webb.

Appellant has used the two uppermost tangs in Webb to create Figure A, attached hereto in Evidence Appendix IX. As shown in Figure A, when the two uppermost tangs of Webb are used to define the line that forms an angle with the center line of its bucket, an angle of less than 14° results. Accordingly, Webb does not teach or suggest the angular relationship of 20.782° disclosed and claimed in the present application.

In applying Webb against these claims the Examiner only used the single uppermost tang of Webb to determine a single point of the line that forms the angle with the respective bucket's centerline -- the Examiner then simply drew the line through the single determined point to form an angle of 20.782° . See Examiner's annotated sketch at page 5 of the Office Action dated October 16, 2007. The Examiner's actions in this regard are not in accordance with the claim language which requires using the two uppermost tangs on each side of a centerline bisecting the bucket, thereby defining a single specific line that formed an angle of 20.782° with the bucket center line. As demonstrated above with reference to Figure A in Evidence Appendix IX, when the two uppermost tangs on each side of the bucket in Webb are used Appellant's claimed angular relationship of 20.782° between the specifically determined line and the centerline does not result.

In addition, it is noted that Webb utilizes key 24 (first embodiment) or key 50 (alternative embodiment) for locking and retaining the turbine rotor blades on the turbine wheel. See, Webb at Figures 1-8, column 1, lines 19-22, column 2, lines 60-66, and column 3, lines 32-75. Moreover, Webb states that "[i]t is to be understood that the particular slot and root form is immaterial." See, column 2, lines 23-24. Thus, Webb also does not teach or suggest the following limitation of claim 29:

wherein said interleaved system of fillets and tangs on said bucket and wheelpost act to reduce stresses acting along on said fitted bucket and wheelpost, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces . . .

Since Webb states that “the particular slot and root form is immaterial” it is clear that it is relying on its disclosed locking keys for maintaining the rotor blades attached to the turbine wheel, and is not in any way concerned with, let alone disclosing, a system of interleaved fillets and tangs for reducing stresses acting along the fitted bucket and wheelpost, as required by claim 29.

Accordingly, claims 29-32 are believed to patentably define over Webb and the Examiner’s rejection of these claims as anticipated by this reference should be reversed.

B2. Whether claims 29-32 are anticipated under 35 U.S.C. § 102(b) by Johnson.

In rejecting claims 29-32 as being anticipated by Johnson, the Examiner has made the same error in rejecting these claims under 35 U.S.C. 112, second paragraph, discussed above. Namely, the Examiner has erroneously used a single upper tang (one on each side of the bucket) to determine a single point used to define a line forming an angle of 20.782° with the center line of the bucket. See the Examiner’s annotated sketch at page 7 of the Office Action dated October 16, 2007. If the two uppermost tangs of Johnson are used, as required by the claim language, to define the line then the angle formed with the center line is less than 16° in Johnson. Indeed, the Johnson reference discloses the angle formed by tangent line TN and center line RCL, shown in Figure 1, to be 15.75° . See Johnson at Figure 1 and column 4, lines 6-9.

Appellant has used the two uppermost tangs in Johnson to create Figure B, attached hereto in Evidence Appendix IX. Figure B utilizes the two uppermost tangs of

Johnson to define the line that forms an angle with the center line of its bucket to be less than 16° . Accordingly, Johnson does not teach or suggest the angular relationship of 20.782° disclosed and claimed in the present application.

In applying Johnson against these claims the Examiner only used the single uppermost tang of Johnson to determine a single point of the line that forms the angle with the respective bucket's centerline -- the Examiner then simply drew the line through the single determined point to form an angle of 20.782° . See the Examiner's annotated sketch at page 7 of the Office Action dated October 16, 2007. The Examiner's actions in this regard are not in accordance with the claim language which requires using the two uppermost tangs on each side of a centerline bisecting the bucket, thereby defining a single specific line that formed an angle of 20.782° with the bucket center line. As demonstrated above with reference to Figure B in Evidence Appendix IX, when the two uppermost tangs on each side of the bucket in Johnson are used Appellant's claimed angular relationship of 20.782° between the specifically determined line and the centerline does not result.

Accordingly, claims 29-32 are believed to patentably define over Johnson and the Examiner's rejection of these claims as anticipated by this reference should be reversed.

C. Whether claims 10 and 13-19 would have been obvious under 35 U.S.C. § 103(a) over Webb in view of By.

In rejecting claims 10 and 13-19 as being unpatentable over Webb in view of By, the Examiner has erroneously applied Webb as above with respect to claims 29-32. More particularly, as noted above, Webb does not teach or suggest the angular

relationship of 20.782° between the specifically determined line (using the two uppermost tangs on each side of the bucket) and the centerline required by independent claim 10.

Since By is directed to the profile of airfoil 10 and not to the profile of dovetail 16, it should be clear that it does not solve this deficiency of Webb. More particularly, By does not disclose any dimensions or angular relationships regarding the configuration of dovetail 16 and, therefore, also does not teach or suggest the required angular relationship of 20.782° between the specifically determined line (using the two uppermost tangs on each side of the bucket) and the center line required by independent claim 10.

Indeed, the Examiner has only cited By for disclosing first and second stages of a turbine having a wheel with sixty broach slots. Accordingly, it is respectfully submitted that claims 10 and 13-17 patentably define over Webb and By, taken singly or in combination, and that the Examiner's rejections of these claims should be reversed.

With respect to the rejection of claims 18 and 19 the Examiner alleges that the specific dimensions given for the bottom tang and bottom fillet, respectively, are mere "matters of choice in design" and cites to *In re Boesch*, 617 F.2d 272 (CCPA 1980) for support of his assertion. However, *In re Boesch* involved a chemical composition case in which there were overlapping ranges between the claimed constituents and those disclosed in the prior art. In addition, the cited case involved an alleged unexpected result for the concentration of a single constituent material. Neither of these factors are present here and, accordingly, the case law cited by the Examiner is inapposite. Claims 18 and 19 require specific dimensions for specific structures, and do not merely recite

ranges. Moreover, these claims recite multiple specific dimensions and configurations for multiple structures from among an infinite number of possibilities for the dimensions and angular relationships of the specific tangs and fillets. The Supreme Court's recent *KSR* decision, stated:

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under §103.

KSR Int'l v. Teleflex, Inc., 550 U.S. ____ (2007) at p.17 (emphasis supplied). Thus, under *KSR* Appellants' invention would not have been obvious, since there were virtually an infinite number of options for the specific number, angular relationships between, and dimensions of the tangs and fillets of the buckets and wheelposts the specific relationships and dimensions arrived at in these claims and not a finite number of identified, predictable solutions.

For all of these reasons it is improper for the Examiner to allege that the specific recitations of these claims are mere matters of design choice. Accordingly, claims 18 and 19 are believed to further patentably define over the cited art, taken singly or in combination.

D. Whether claim 12 would have been obvious under 35 U.S.C. § 103(a) over Webb and By in view of the '142 patent.

In rejecting claim 12, the Examiner has relied on a combination of Webb, By and the '142 patent. As noted above, neither Webb nor By teach or suggest the required

angular relationship of 20.782° between the specifically determined line (using the two uppermost tangs on each side of the bucket) and the center line of the bucket as required by independent claim 10 from which claim 12 depends. Since, the '142 patent has only been cited for disclosing "bucket tangs having an angle of 55 degrees" it should be clear that this reference does not solve the deficiency noted above regarding the required angular relationship of 20.782° . Indeed, Figure 1 of the '142 patent clearly indicates that the required angular relationship would be only 15° (i.e., half of the 30° angle shown in Figure 1 of the '142 patent). Accordingly, it is respectfully submitted that claim 12 patentably defines over Webb, By and the '142 patent, taken singly or in any combination, and that the Examiner's rejection of this claim should be reversed.

E. Whether claim 20 would have been obvious under 35 U.S.C. § 103(a) in view of Caruso.

In rejecting claim 20, over a combination of Webb, By and Caruso, the Examiner merely cites Caruso for disclosing that the "outer tang edge of each wheelpost is scalloped." Thus, it should be clear that Caruso does not solve the deficiencies noted above with respect to Webb and By. Namely, none of these three references teaches or suggest the required angular relationship of independent claim 10 from which claim 20 depends. Accordingly, claim 20 is believed to patentably define over the cited art taken singly or in combination.

Moreover, Caruso does not teach anywhere in its disclosure that it is providing scalloped wheelposts as required by claim 20. Caruso is concerned with a system that provides for the final bucket to be radially inserted into the wheelpost thereby allowing interlocking covers 18 to mate with each other. See, Caruso at Figures 1-3 and column

3, line 32 to column 4, line 22. There is simply no mention anywhere in Caruso of providing scalloped wheelposts to reduce the weight of the wheel, as required by claim 20. Apparently, the Examiner has misinterpreted Figure 1 (the only figure directed to the wheel in Caruso) as showing "scalloped tangs." Figure 1 merely shows two protrusions, i.e., additional material not removed material, on the outer tang of wheel 10 and does not otherwise describe or even identify these protrusions with a reference numeral anywhere in its specification.

Accordingly, it is respectfully submitted that, absent the hindsight provided by Appellant's application, those skilled in the art would not have considered the protrusions or the Caruso reference as disclosing scalloped wheelposts. Therefore, claim 20 is believed to patentably define over the cited references for this additional reason.

F. Whether claim 33 would have been obvious under 35 U.S.C.

§ 103(a) over Webb.

In rejecting claim 33 as being unpatentable over Webb the Examiner asserts that the specific dimensions given for the bottom tang is a mere “matter of choice in design” and cites to *In re Boesch*, 617 F.2d 272 (CCPA 1980) for support of his assertion. However, as previously noted, *In re Boesch* involved a chemical composition case in which there were overlapping ranges between the claimed constituents and those disclosed in the prior art. In addition, the cited case law involved an alleged unexpected result for the concentration of a single constituent material. Neither of these factors are present here and, accordingly, the case law cited by the Examiner is inapposite.

Claim 33 requires specific dimensions for specific structures, and does not merely recite ranges. Moreover, this claim recites multiple specific dimensions and configurations for multiple structures from among an infinite number of possibilities for the dimensions and angular relationships of the specific tangs and fillets and thus does not meet the requirement of a finite number of identified, predictable solutions as set forth in the Supreme Court's *KSR* decision. For all of these reasons it is improper for the Examiner to allege that the specific recitations of claim 33 is a mere matter of design choice. Accordingly, claim 33 is believed to further patentably define over the cited art and, therefore, the Examiner's rejection of the claim should be reversed.

Moreover, as noted above, Webb fails to teach or suggest the specific angular relationship required in claim 29 from which claim 33 depends. Accordingly, claim 33 is believed to also patentably define over Webb by virtue of its dependency from claim 29.

G. Whether claims 34-40 would have been obvious under 35 U.S.C.

§ 103(a) over Webb in view of Leonardi.

In rejecting claims 34-40 the Examiner has relied on a combination of Webb and Leonardi. As noted above, Webb does not teach or suggest the required angular relationship of 20.782° between the specifically determined line (using the two uppermost tangs on each side of the bucket) and the centerline in independent claim 10 from which claim 12 depends. Since Leonardi has only been cited for disclosing tangs formed from curved surfaces with more than one radii of curvature, it should be clear that this reference does not solve the deficiency of Webb noted above regarding the required angular relationship of 20.782°. Accordingly, it is respectfully submitted that claims 34-40 patentably define over Webb and Leonardi, taken singly or in combination, and that the Examiner's rejection of these claims should be reversed.

H. Whether claims 41-43 would have been obvious under 35 U.S.C.

§ 103(a) over Pisz in view of By.

The Examiner admits that neither Pisz nor By disclose the specific dimensional relationships for the fillets and tangs as required by claims 41-43. In rejecting the claims the Examiner improperly asserts that the specific dimensions given for the fillets and tangs in claims 41-43 are mere "matters of choice in design" and cites to *In re Boesch*, 617 F.2d 272 (CCPA 1980) for support of his assertion. However, as previously noted, *In re Boesch* involved a chemical composition case in which there were overlapping ranges between the claimed constituents and those disclosed in the prior art. In addition, the cited case law involved an alleged unexpected result for the concentration of a single constituent material. Neither of these factors are present here

and, accordingly, the case law cited by the Examiner is inapposite. Moreover, while *KSR*, as discussed above, holds that a finite number of identified, predictable solutions within the technical grasp of one skilled in the art might have been obvious to try this is not the case here.

Claims 41-43 require specific dimensions for specific structures, and do not merely recite ranges. Moreover, the dependant claims 42-43 recite multiple specific dimensions and configurations for multiple structures from among an infinite number of possibilities for the dimensions and angular relationships of the specific tangs and fillets. For all of these reasons it is improper for the Examiner to allege that the specific recitations of claims 41-43 are mere matters of design choice. Accordingly, claims 41-43 are believed to patentably define over the cited art, taken either singly or in combination, and, therefore, the Examiner's rejection of the claims should be reversed.

I. Whether claims 44-45, 55-56 and 59-60 would have been obvious under 35 U.S.C. § 103(a) over Heinig in view of By.

The Examiner admits that neither Heinig nor By disclose the specific dimensional relationships for the fillets and tangs as required by claims 44-45, 55-56 and 59-60. In rejecting the claims the Examiner improperly asserts that the specific dimensions given for the fillets and tangs in these claims are mere matters of choice in design, and cites to *In re Boesch*, 617 F.2d 272 (CCPA 1980) for support of his assertion. However, as previously noted, *In re Boesch* involved a chemical composition case in which there were overlapping ranges between the claimed constituents and those disclosed in the prior art. In addition, the cited case law involved an alleged unexpected result for the concentration of a single constituent material. Neither of these factors are present here

and, accordingly, the case law cited by the Examiner is inapposite. Moreover, while *KSR*, as discussed above, holds that a finite number of identified, predictable solutions within the technical grasp of one skilled in the art might have been obvious to try this is not the case here.

Each of the rejected claims require specific dimensions for specific structures, and do not merely recite ranges. Moreover, the dependant claims 45, 56, 59 and 60 require multiple specific dimensions and configurations for multiple structures from among an infinite number of possibilities for the dimensional relationships of the specific tangs and fillets. For all of these reasons it is improper for the Examiner to allege that the specific recitations of these claims are mere matters of design choice. Accordingly, claims 44-45, 55-56 and 59-60 are believed to patentably define over the cited art, taken either singly or in combination, and, therefore, the Examiner's rejection of the claims should be reversed.

J. Whether claims 48-49 would have been obvious under 35 U.S.C. § 103(a) over Heinig and By in view of Phipps.

In rejecting claims 48-49 the Examiner has applied Phipps in combination with Heinig and By. The Examiner admits that none of the cited references discloses any of the specific dimensions for the tangs and fillets required by the rejected claims.

Indeed, Phipps is only being cited for disclosing 55° for the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang instead of the required angle of 50° in claims 48 and 49. Moreover, Phipps does not even disclose the Examiner's alleged angle of 55° anywhere in its specification. Nor is there any figure in Phipps from which an accurate measurement of

the angle could be obtained – Figures 1 and 2 are perspective drawings and Figure 3 is a partial drawing that does not even show the upper fillet and tang from which the required angle could be measured.

Since none of the cited references teach or suggest the specific dimensional and angular relationships of the tangs and fillet required by claims 48 and 49, these claims are believed to patentably define over the cited art taken singly or in combination.

K. Whether claims 52-53 would have been obvious over Johnson in view of By.

In rejecting these claims the Examiner has misapplied the cited art. More particularly, the Examiner is asserting bucket dimensions disclosed in Johnson against broach slot dimensions required by claims 52-53. Moreover, the Examiner alleges that compound radii R3 and R4 (equal to each other, but applied from different points taken along a centerline of the tang) for the dimensioning of the upper tang of the bucket, as shown in Figure 1 of Johnson, somehow reads onto the single radius of curvature required for the fillet recited in claim 52 (i.e., R11 as shown in Fig. 12 and described at paragraph 65 of Appellant's application).

Nowhere does Johnson teach or suggest the single radius of curvature required for the fillet in claim 52. Nowhere does Johnson teach or suggest the single radius of curvature required for the fillet in claim 53. Finally, as noted above, By clearly does not overcome these deficiencies of Johnson since it merely discloses profile dimensions for turbine blades not dovetails, and it has merely been cited for disclosing a turbine wheel having sixty buckets.

Finally, it should be pointed again, that the dimensions for the tangs and fillets required in these claims are not merely design choices, and that the Examiner's case law citation to *In re Boesch* is inapposite here, for the same reasons given above. Moreover, while *KSR*, as discussed above, holds that a finite number of identified, predictable solutions within the technical grasp of one skilled in the art might have been obvious to try this is not the case here.

Accordingly, claims 52-53 are believed to patentably define over the cited art, taken either singly or in combination, and, therefore, the Examiner's rejection of the claims should be reversed.

CONCLUSION


In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the rejection of all appealed claims and passage of the subject application to issue are earnestly solicited.

LAGRANGE et al.
Serial No. 10/774,400

Respectfully submitted,

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(VIII) CLAIMS APPENDIX

10. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets and tangs; and

a plurality of buckets each having a corresponding interleaved system of fillets and tangs so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and wheelposts act to reduce stresses acting on said fitted buckets and wheelposts, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of said buckets define two points of a respective line that form an angle of 20.782° with the center line; and;

wherein a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782° with the center line.

12. A turbine as claimed in claim 10, wherein the fillets formed on said plurality of buckets have angles ranging from 50° to 57° .

13. A turbine as claimed in claim 10, each one of said buckets and wheelposts having three interleaved tangs and fillets.
14. A turbine as claimed in claim 13, wherein each of said buckets having a bottom tang formed from curved surfaces having more than one radius of curvature.
15. A turbine as claimed in claim 14, wherein each of said buckets further includes at least one straight surface.
16. A turbine as claimed in claim 10, wherein each of said wheelposts having a bottom fillet formed from curved surfaces having more than one radius of curvature.
17. A turbine as claimed in claim 16, wherein each of said wheelposts further includes at least one straight surface.
18. A turbine as claimed in claim 14, wherein said curved surfaces have radii of curvatures of .3762 inches and .5556 inches.
19. A turbine as claimed in claim 16, wherein said curved surfaces have radii of curvatures of .3822 inches and .5616 inches.
20. A turbine as claimed in claim 10, wherein a top surface of each one of said wheelposts being scalloped so as to reduce the weight of said wheel.

29. A bucket for insertion into a wheelpost of a turbine rotor, said bucket being formed from interleaved fillets and tangs which complement interleaved fillets and tangs formed in the wheelpost,

wherein said interleaved system of fillets and tangs on said buckets and wheelposts act to reduce stresses acting on said fitted buckets and wheelposts, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of said buckets define two points of a respective line that form an angle of 20.782° with the center line; and

wherein a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782° with the center line.

30. A bucket as claimed in claim 29, said bucket having three interleaved tangs and fillets.

31. A bucket as claimed in claim 30, said bucket having a bottom tang formed from curved surfaces having more than one radius of curvature.

32. A bucket as claimed in claim 31, said bucket further including at least one straight surface.

33. A bucket as claimed in claim 31, said curved surfaces having radii of curvatures of .3762 inches and .5556 inches.

34. A bucket as claimed in claim 30, said bucket having an upper tang formed from curved surfaces having more than one radius of curvature.

35. A bucket as claimed in claim 31, said bucket having an upper tang formed from curved surfaces having more than one radius of curvature.

36. A bucket as claimed in claim 34, said bucket further including at least one straight surface.

37. A bucket as claimed in claim 30, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature.

38. A bucket as claimed in claim 31, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature.

39. A bucket as claimed in claim 35, said bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature.

40. A bucket as claimed in claim 37, said bucket further including at least one straight surface.

41. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets and tangs; and

a plurality of buckets each having a corresponding interleaved system of fillets and tangs so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein above the uppermost tang on each of said buckets there is a compound fillet having a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches.

42. The turbine as claimed in claim 41, wherein below the upper most tang on each of said buckets there is a fillet having a radius of curvature of 0.0741 inches.

43. The turbine as claimed in claim 42, wherein above the bottom most tang on each of said buckets there is a fillet having a radius of curvature of 0.0897 inches.

44. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets and tangs; and

a plurality of buckets each having a corresponding interleaved system of fillets and tangs so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 1.9836 inches.

45. The turbine as claimed in claim 44, wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang is 0.8429 inches.

46. The turbine as claimed in claim 45, wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to a second intersection point of tangent lines drawn along pressure faces of the upper most tang is 1.2588 inches.

47. The turbine as claimed in claim 46, wherein for each one of said plurality of buckets the distance from the bottom of the bottom most tang to a point defined by the intersection of a line through said first and second intersection points and a tangent line along an upper straight surface of the bottom most tang is 0.4177 inches.

48. The turbine as claimed in claim 44, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees.

49. The turbine as claimed in claim 45, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees.

50. The turbine as claimed in claim 46, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees.

51. The turbine as claimed in claim 47, wherein for each one of said plurality of buckets the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 50 degrees.

52. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets and tangs; and

a plurality of buckets each having a corresponding interleaved system of fillets and tangs so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein below the uppermost tang on each of said broach slots there is a fillet having a radius of curvature of 0.0959 inches.

53. The turbine as claimed in claim 52, wherein above the bottom most tang on each of said broach slots there is a fillet having a radius of curvature of 0.1037 inches.

54. The turbine as claimed in claim 53, wherein below the bottom most tang on each of said broach slots there is a compound fillet having a first radius of curvature of 0.1248 inches and a second radius of curvature of 0.3822 inches, the first radius of curvature being measured from two points equally offset 0.0327 inches from either side of a center line bisecting each of said broach slots and at a distance of 0.3852 inches from the bottom of said compound fillet, and the second radius of curvature being

measured from the center line bisecting each of said broach slots at a distance of 0.5616 inches from the bottom of said compound fillet.

55. A turbine having multiple turbine stages, first and second turbine stages comprising:

a wheel having sixty broach slots, each one of said broach slots having an interleaved system of fillets and tangs; and

a plurality of buckets each having a corresponding interleaved system of fillets and tangs so that said plurality of buckets can be fitted, one to one, into said sixty broach slots on said wheel;

wherein said interleaved system of fillets and tangs on said buckets and broach slots act to reduce stresses acting on said fitted buckets and broach slots, the fillets and tangs of said interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces;

wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 1.9836 inches.

56. The turbine as claimed in claim 55, wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet is 0.8433 inches.

57. The turbine as claimed in claim 56, wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to a second intersection point of tangent lines drawn along pressure faces of the upper most fillet is 1.2592 inches.

58. The turbine as claimed in claim 57, wherein for each one of said broach slots the distance from the bottom of the bottom most fillet to a point defined by the intersection of a line through said first and second intersection points and a tangent line along an upper straight surface of the bottom most fillet is 0.4181 inches.

59. The turbine as claimed in claim 55, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees.

60. The turbine as claimed in claim 56, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees.

61. The turbine as claimed in claim 57, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees.

62. The turbine as claimed in claim 58, wherein for each one of said broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees.

(IX) EVIDENCE APPENDIX

Figures A and B. Office Action dated October 16, 2007.

FIGURE A

Aug. 24, 1965

JAMES E. WEBB
ADMINISTRATOR OF THE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION

3,202,398

LOCKING DEVICE FOR TURBINE ROTOR BLADES

Filed Nov. 5, 1962

2 Sheets-Sheet 1

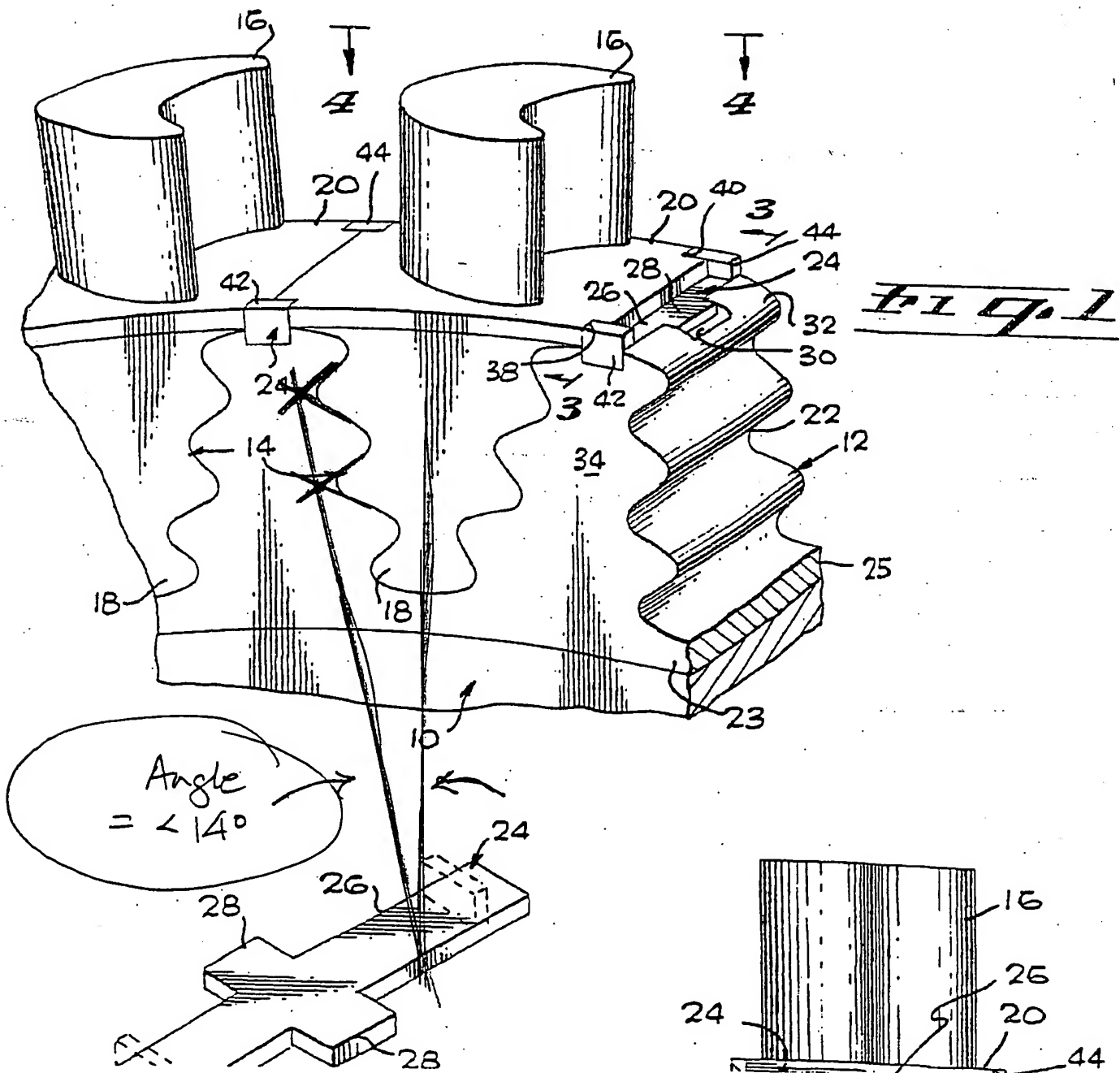


FIGURE B

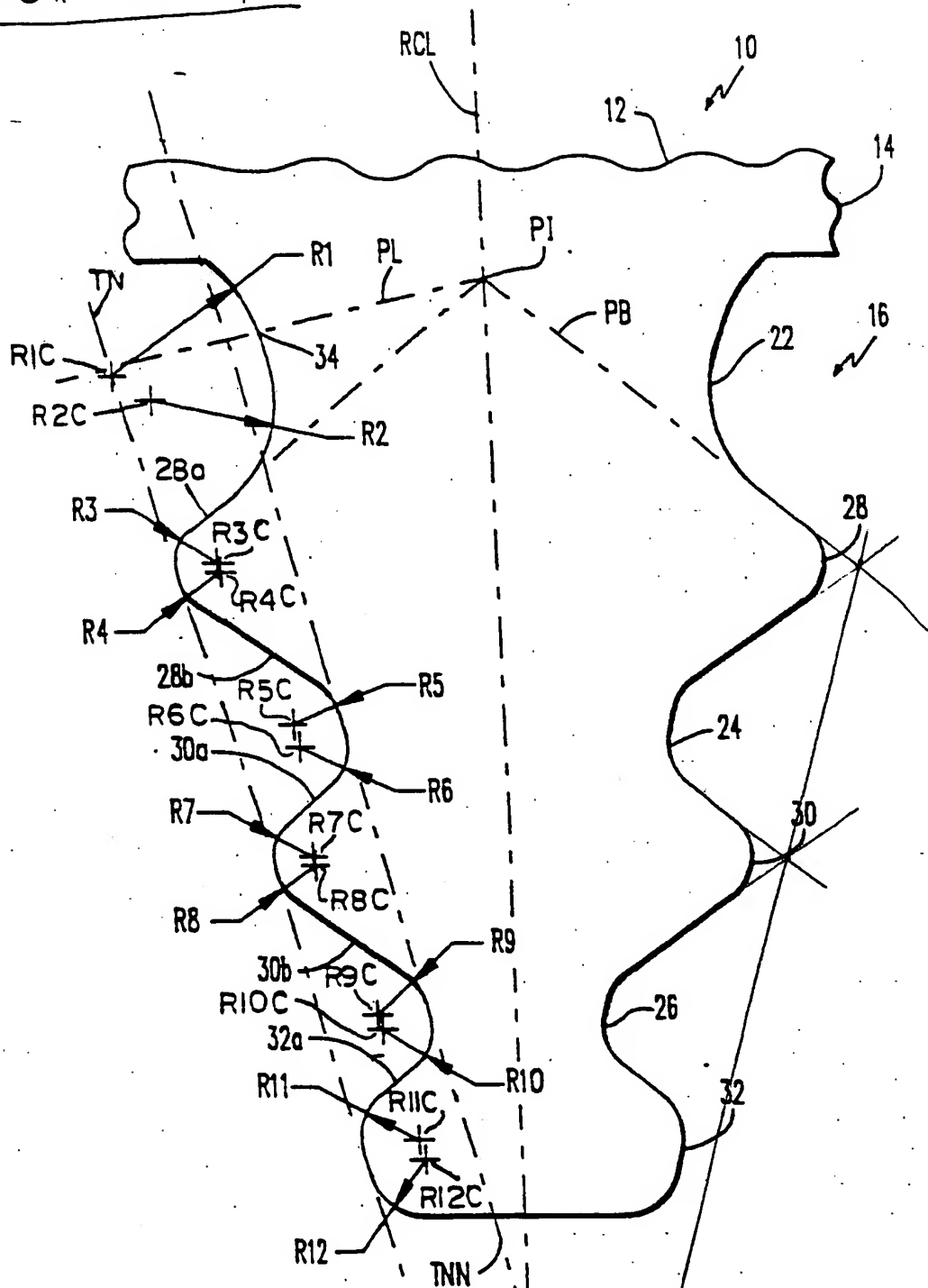


FIG. 1

Angle = $\approx 16^\circ$

128759-1



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,400	02/10/2004	Benjamin Arnette Lagrange	839-1383	9775

30024 7590 10/16/2007
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EXAMINER	
VERDIER, CHRISTOPHER M	

ART UNIT	PAPER NUMBER
3745	

MAIL DATE	DELIVERY MODE
10/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DOCKETED

CLT/MATTER # 839-1383
 MAIL DATE 10/16/07
 DUE DATE Jan 16, 2008 ✓
 FINAL DEADLINE Apr 16, 2008
 DOCKETED BY BTG/ff

Office Action Summary

Application No.

10/774,400

Examiner

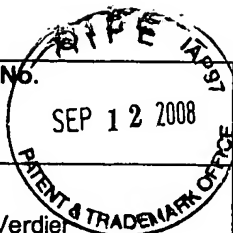
Christopher Verdier

Applicant(s)

LAGRANGE ET AL.

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3745



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10, 12-20 and 29-62 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10, 12-20, 29-45, 48-49, 52-53, 55-56, 59-60 is/are rejected.
- 7) ☒ Claim(s) 46, 47, 50, 51, 54, 57, 58, 61 and 62 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2-10-04, 8-15-07 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 15, 2007 has been entered.

Applicant's Amendment dated August 15, 2007 has been carefully considered. The specification has been amended to provide antecedent basis for claims 10 and 29. The Replacement Sheet of Drawings for figure 10 is approved by the examiner. Correction of these matters is noted with appreciation.

Applicant's arguments have been carefully considered. Concerning United Kingdom Patent 677,142, this reference does not clearly show the upper most tangs, and the angle formed by the upper most tangs and the bucket center line is indeterminate. Concerning Webb 3,202,398, Applicant has argued that this reference does not teach or suggest the arrangement in independent claims 10 and 29 of the straight surfaces of each of the two uppermost tangs on either side of the center line bisecting each of the buckets defining two points of a line that form an angle of 20.782 degrees with the center line. This argument is not persuasive, because Webb 3,202,398 still discloses this subject matter, as well as Johnson 5,147,180. The straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 20.782 degrees with the center

line on both of these references. The line drawn from the intersection of the straight surfaces of each of the two upper most tangs may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 20.782 degree angle, such that this angle is the same as Applicant's angle E of 20.782 degrees in figure 10, and a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782 degrees with the center line, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figures for both Webb and Johnson later below.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

✓ Claims 10, 12-20, and 29-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10, lines 12-14 recite the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets define two points of a respective line that form an angle of 20.782 degrees with the center line. This is inaccurate and should be amended to state that the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 20.782 degrees with the center line, since each tang defines the point of the line. In claim 12, line 2, "fillets" is inaccurate and should be changed to -- tangs --. In claim 29, line 5, "said buckets" lacks antecedent basis. Claim 29, lines 9-11 recite the straight

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surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets define two points of a respective line that form an angle of 20.782 degrees with the center line. This is inaccurate and should be amended to state that the straight surfaces of each of two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 20.782 degrees with the center line, since each tang defines the point of the line.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

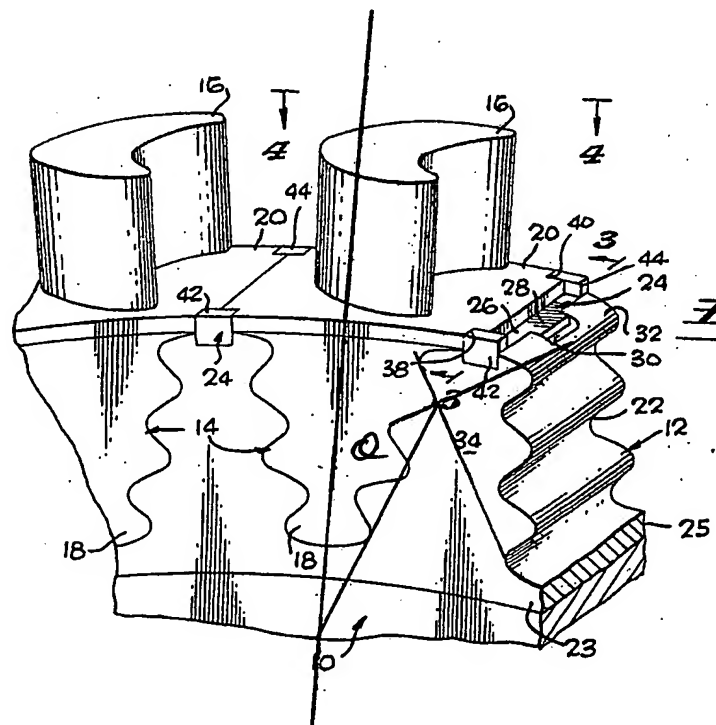
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

✓ Claims 29-32, as far as they are definite and understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Webb 3,202,398. Note the buckets 16 for insertion into wheelposts 34 of a turbine rotor 10, the buckets being formed from interleaved unnumbered fillets and tangs which complement interleaved fillets and tangs (near 22) formed in the wheelposts, the interleaved system of fillets and tangs on the buckets and wheelposts acting to reduce stresses acting on the fitted buckets and wheelposts, the fillets and tangs of the interleaved system each being formed by a combination of curved and straight surfaces, with the straight surfaces of each of the two upper most tangs on each side of a center line bisecting each of the buckets each respectively defining a point of a respective line that forms an angle of 20.782 degrees with the center line, and a point defined by intersecting tangent lines along pressure

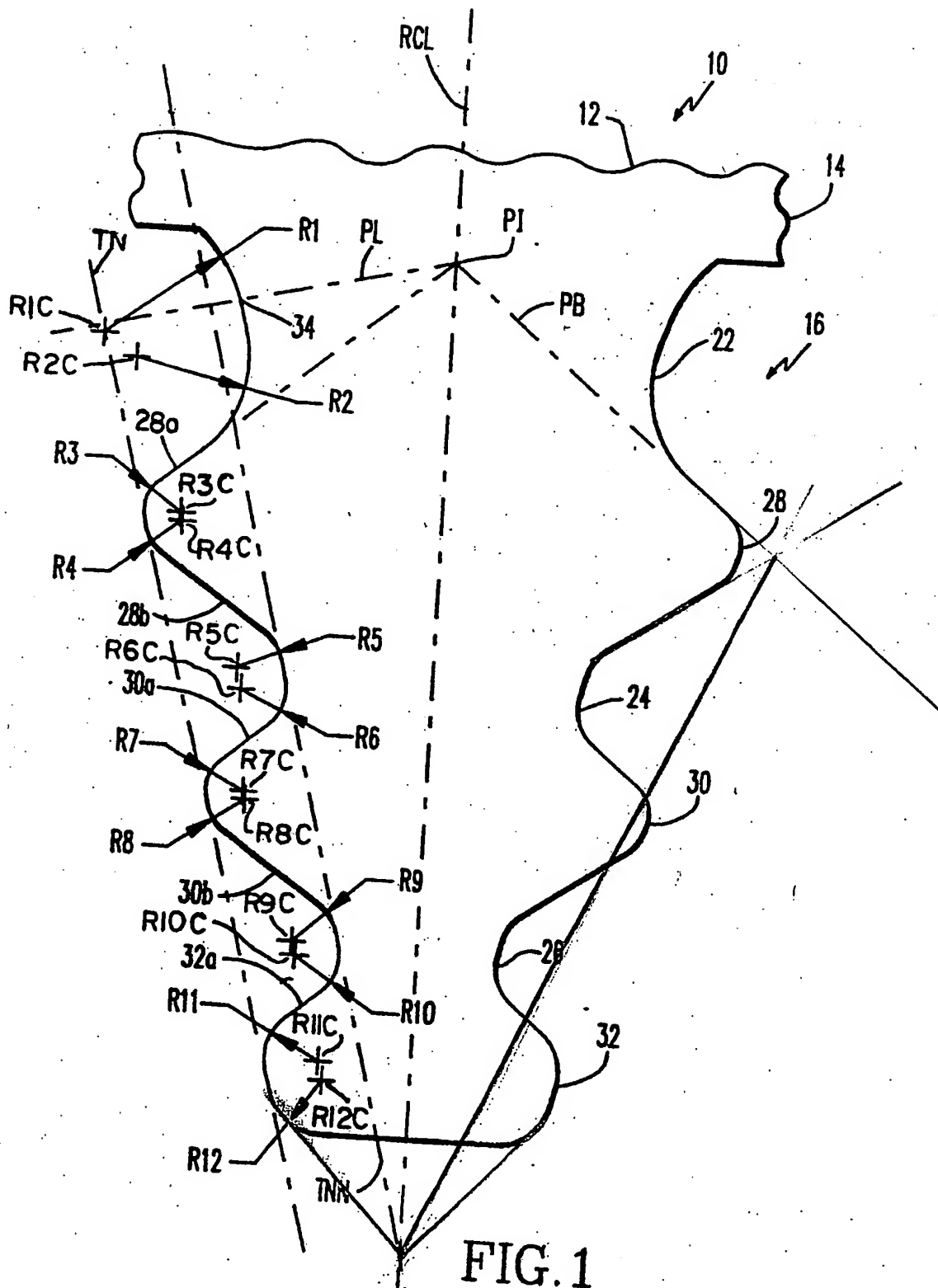
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faces of the bottommost tang does not lie on either line that forms the angle of 20.782 degrees with the center line. The bucket has three interleaved tangs and fillets. The bucket has a bottom tang 18 formed from curved surfaces having more than one radius of curvature. The bucket further includes at least one straight surface (the leading and trailing edges). The line drawn from the intersection of the straight surfaces of each of the two upper most tangs may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 20.782 degree angle, such that this angle is the same as Applicant's angle E of 20.782 degrees in figure 10, and a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782 degrees with the center line, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure below.



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✓ Claims 29-32, as far as they are definite and understood, are also rejected under 35 U.S.C. 102(b) as being anticipated by Johnson 5,147,180. Note the buckets 12 for insertion into unnumbered wheelposts of a turbine rotor 20, the buckets being formed from interleaved fillets and tangs 22, 24, 26, 28, 30, 32 which complement unnumbered interleaved fillets and tangs formed in the wheelposts, the interleaved system of fillets and tangs on the buckets and wheelposts acting to reduce stresses acting on the fitted buckets and wheelposts, the fillets and tangs of the interleaved system each being formed by a combination of curved and straight surfaces, with the straight surfaces of each of the two upper most tangs on each side of a center line bisecting each of the buckets each respectively defining a point of a respective line that forms an angle of 20.782 degrees with the center line, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle of 20.782 degrees with the center line. The bucket has three interleaved tangs and fillets. The bucket has a bottom tang 32 formed from curved surfaces having more than one radius of curvature. The bucket further includes at least one straight surface 30a, 30b. The line drawn from the intersection of the straight surfaces of each of the two upper most tangs may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 20.782 degree angle, such that this angle is the same as Applicant's angle E of 20.782 degrees in figure 10, and a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782 degrees with the center line, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure below.



Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

✓ Claims 10 and 13-17, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 in view of By 6,461,110. Webb discloses a turbine substantially as claimed, comprising a wheel 10 having plural broach slots 22, each having an interleaved system of fillets and tangs, and plural buckets 16 each having a corresponding interleaved system of fillets and tangs so that the plural buckets can be filled, one to one, into the plural broach slots, with the interleaved system of fillets and tangs on the buckets and wheelposts 34 inherently acting to reduce stresses acting on the fitted buckets and wheelposts (due to the dovetail shape), the fillets and tangs of the interleaved system of fillets

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and tangs each being formed by a combination of curved and straight surfaces. The straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a respective line that forms an angle of 20.782 degrees with the center line, with a point defined by intersecting tangent lines along pressure faces of the bottommost tang not lying on either line that forms the angle of 20.782 degrees with the center line. The buckets and wheelposts have three interleaved tangs and fillets. Each of the buckets has a bottommost tang 18 formed from unnumbered curved surfaces having more than one radius of curvature (at the bottom of the tang and the top of the tang). Each bucket has straight surfaces (the leading and trailing edges). Each of the wheelposts has an unnumbered bottom fillet formed from curved surfaces having more than one radius of curvature (at the bottom and at the top). Each wheelpost includes unnumbered straight surfaces. The line drawn from the intersection of the straight surfaces of each of the two upper most tangs may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 20.782 degree angle, such that this angle is the same as Applicant's angle E of 20.782 degrees in figure 10, and a point defined by intersecting tangent lines along pressure faces of the bottom most tang does not lie on either line that forms the angle of 20.782 degrees with the center line, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure below.

However, Webb does not disclose that the turbine is formed such that first and second stages each have a wheel having sixty broach slots (claims 10-11).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Webb such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Webb such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

✓ Claim 12, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claim 10 above, and further in view of United Kingdom Patent 677,142. The modified turbine of Webb shows all of the claimed subject matter except for the bucket tangs having an angle of 55 degrees.

United Kingdom Patent 677,142 shows a turbine having a rotor with unnumbered buckets having tangs 3 which are formed at an angle of 55 degrees, for the purpose of providing more favorable stress conditions in the turbine buckets and rotor.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Webb such that the bucket tangs have angles of 55 degrees, as taught by United Kingdom Patent 677,142, for the purpose of providing more favorable stress conditions in the turbine buckets and rotor.

✓ Claims 18-19, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claims 14 and 16, respectively above. The modified turbine of Webb show all of the claimed subject matter except for the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 18), and except for the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claim 19).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention

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was made to a person having ordinary skill in the art to select the radii of curvature in the modified turbine of Webb such that the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

✓ Claim 20, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claim 10 above, and further in view of Caruso 6,030,178. The modified turbine of Webb shows all of the claimed subject matter, including unnumbered wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Webb such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

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✓ Claim 33, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398. Webb discloses a turbine substantially as claimed as set forth above, including the bucket having a bottom tang 18 formed from curved surfaces having more than one radius of curvature.

However, Webb does not disclose the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 33).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches is a matter of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

✓ Claims 34-40, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 in view of Leonardi 4,191,509. Webb

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discloses a bucket substantially as claimed as set forth above, but does not disclose the upper tang formed from curved surfaces with more than one radii of curvature (claims 34-35), and does not show the intermediate tang 30 formed from curved surfaces with more than one radii of curvature (claims 37-39).

Leonardi (figures 1-2 and 4) shows a bucket 18 having a root 16 with an upper tang 28 formed from curved surfaces with more than one radii of curvature R1, R2, and an intermediate tang 28 having more than one radius of curvature R1, R2, for the purpose of improving low cycle fatigue, and reducing combined bending and shear stress.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the bucket of Webb such that the upper tang is formed from curved surfaces with more than one radii of curvature, and intermediate tang is formed from curved surfaces with more than one radii of curvature, as taught by Leonardi, for the purpose of improving low cycle fatigue, and reducing combined bending and shear stress.

✓ Claims 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pisz 4,824,328 in view of By 6,461,110. Pisz (figures 1-6 and Table 7) discloses a turbine substantially as claimed, comprising a wheel 21 having broach slots 19, each having an interleaved system of fillets and tangs, and a plurality of buckets 15 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the

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buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein above the uppermost tang on each of the buckets there is a compound fillet having a first radius of curvature R1 of 0.3128 inches and a second radius of curvature R2 having 0.0873 inches. Below the upper most tang on each of the buckets there is a fillet having a radius of curvature R5 of 0.0477 inches. Above the bottom most tang on each of the buckets there is a fillet having a radius of curvature R10 of 0.0477 inches.

However, Pisz does not disclose that the turbine has multiple stages (claim 41), does not disclose that that first and second stages have the above fillet and tang configurations (claim 41), does not disclose sixty broach slots that receive sixty buckets (claim 41), does not disclose that above the uppermost tang on each of the buckets the compound fillet has a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches (claim 41), does not disclose that below the upper most tang on each of the buckets the fillet has a radius of curvature of 0.0741 inches (claim 42), and does not disclose that above the bottom most tang on each of the buckets the fillet has a radius of curvature of 0.0897 inches (claim 43).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Pisz to include multiple stages and such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the Pisz such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the uppermost tang on each of the buckets the compound fillet having a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches, the recitation that below the upper most tang on each of the buckets the fillet has a radius of curvature of 0.0741 inches, and the recitation that above the bottom most tang on each of the buckets the fillet has a radius of curvature of 0.0897 inches, are deemed to be matters of choice in design. The radii of curvature of the bucket tangs are recognized by Pisz to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the bucket tangs to be specific values, such as the uppermost tang on each of the buckets having the compound fillet with a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches, such as below the upper most tang on each of the buckets the fillet having a radius of curvature of 0.0741 inches, and such as

above the bottom most tang on each of the buckets the fillet having a radius of curvature of 0.08975 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 in view of By 6,461,110. Heinig discloses a turbine substantially as claimed, comprising a wheel 18 having broach slots 16, each having an interleaved system of fillets and tangs, and a plurality of buckets 9 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein for each one of the plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 0.9480 inches (figure 4). For each one of the plurality of buckets, the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang appears to be greater than 60 percent of the distance 0.9480 inches.

However, Heinig does not disclose that the turbine has multiple stages (claim 44), does not disclose that that first and second stages have the above fillet and tang configurations (claim 44), does not disclose sixty broach slots that receive sixty buckets (claim 44), does not disclose

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that for each one of the plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 1.9836 inches (claim 44), and does not disclose that for each one of the plurality of buckets the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang is 0.8429 inches (claim 45).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig to include multiple stages and such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the Heinig such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

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The recitation of the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet being 1.9836 inches, and the recitation of the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang being 0.8429 inches are matters of choice design. These dimensions are recognized by Heinig to be result-effective variables which when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet to be a specific value, such as 1.9836 inches, and to select the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang to be 0.8429 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 and By 6,461,110 as applied to claims 44 and 45, respectively above, and further in view of Phipps 6,893,226. The modified turbine of Heinig shows all of the claimed subject matter except for the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang being 50 degrees.

Phipps shows a turbine blade 30 having an angle between an upper most straight portion of an upper most fillet 52 and an upper most straight portion of an upper most tang being 55 degrees, for the purpose of allowing the blade to withstand centrifugal loading when in operation.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Heinig such that the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 55 degrees. The specific recitation of this angle being 50 degrees is a matter of choice in design. This angle is known to be a result-effective variable which adjusts the stress distribution in the blade roots. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Heinig such that this specific angle is 50 degrees, for the purpose of optimizing the stress distribution in the blade roots, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

✓ Claims 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson 5,147,180 in view of By 6,461,110. Johnson discloses a multiple stage turbine substantially as claimed, comprising a wheel 20 having unnumbered broach slots, each having an interleaved system of fillets and tangs, and a plurality of buckets 10 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and

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broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein below the uppermost tang on each of the broach slots there is fillet (corresponding to R3, R4) having a radius of curvature of about 0.0721 inches, and above a bottom most tang on each of the broach slots there is a fillet (corresponding to R11) of about 0.0945 inches.

However, Johnson does not disclose that the first and second stages have the above fillet and tang configurations (claim 52), does not disclose sixty broach slots that receive sixty buckets (claim 52), does not disclose that below the uppermost tang on each of the broach slots the fillet has a radius of curvature of 0.0959 inches (claim 52), and does not disclose that above the bottom most tang on each of the broach slots the fillet has a radius of curvature of 0.1037-inches (claim 53).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Johnson such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to

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a person having ordinary skill in the art to form the turbine of Johnson such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation that below the uppermost tang on each of the broach slots the fillet has a radius of curvature of 0.0959 inches, and that above the bottom most tang on each of the broach slots the fillet has a radius of curvature of 0.1037 inches, are matters of choice in design. Johnson recognizes that these are result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radius of curvature of the uppermost tang on each of the broach slots of the fillet to have a specific radius of curvature, such as 0.0959 inches, and to select the radius of curvature above the bottom most tang on each of the broach slots of the fillet to have a specific radius of curvature, such as of 0.1037 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

✓ Claims 55-56 and 59-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 in view of By 6,461,110. Heinig discloses a turbine substantially as claimed,

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comprising a wheel 18 having unnumbered broach slots, each having an interleaved system of fillets and tangs, and a plurality of buckets 9 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein for each one of the broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 0.9500 inches (figure 3). For each one of the plurality of broach slots, the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet appears to be greater than 60 percent of the distance 0.9500 inches.

However, Heinig does not disclose that the turbine has multiple stages (claim 55), does not disclose that that the first and second stage has the above fillet and tang configurations (claim 55), does not disclose sixty broach slots that receive sixty buckets (claim 55), does not disclose that for each one of the broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 1.9836 inches (claim 55), does not disclose that for each one of the plurality of broach slots, the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet is 0.8433 inches (claim 56), and does not disclose that for each one of

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the broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees (claims 59 and 60).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig to include multiple stages and such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang being 1.9836 inches, the recitation of the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet being 0.8433 inches, and the

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recitation of the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet being 50 degrees, are matters of choice design. These lengths and this angle are recognized by Heinig and in the art to be result-effective variables which when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang to be a specific value, such as 1.9836 inches, to select the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet to be 0.8433 inches, and to select the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet to be 50 degrees, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Allowable Subject Matter

Claims 46, 47, 50, 51, 54, 57, 58, 61, and 62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

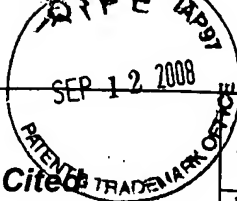
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C.V.
October 9, 2007


Christopher Verdier
Primary Examiner
Art Unit 3745



Notice of References Cited

Application/Control No.

10/774,400

Applicant(s)/Patent Under
Reexamination
LAGRANGE ET AL.

Examiner

Christopher Verdier

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U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,893,226 B2	05-2005	Phipps	416/248
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	C	US-			
	D	US-			
	E	US-			
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not being furnished with this Office action. (See MPEP § 707.05(a).)
re publication dates. Classifications may be US or foreign.

(X) RELATED PROCEEDINGS APPENDIX

None.